Figure 5-1A . Caltrans Orders of Survey Accuracy

CALTRANS ORDER (Note 1)	STANDARDS			MONUMENT SPACING AND SURVEY METHODS (Note 2)			APPLICATION – TYPICAL SURVEYS	
	CLASSICAL		POSITIONAL	MONUMENT SPACING (MINIMUM)	TYPICAL SURVEY METHOD			
	HORIZONTAL (Note 4)	VERTICAL (Note 4)			HORIZONTAL	VERTICAL	HORIZONTAL	VERTICAL
B (Note 3)	1 : 1,000,000 (Note 10)	Not Applicable	Per NGS Specifications	6 miles	GPS: Static	Not Applicable	High Precision Geodetic Network (HPGN)	Not Applicable
First (Note 3)	1 : 100,000	e = 0.025√E (Note 5)	Per NGS Specifications	10,000 feet	GPS: Static Fast Static	Electronic/Digital Bar-Code Level	Basic (Corridor) Control – HPGN-D Project Control – Horizontal (preferred, when feasible)	Rarely used. Crustal Motion Surveys, etc.
Second	1 : 20,000	e = 0.04√E (Note 5)	(Note 8)	1,600 feet	GPS: Static Fast Static TSSS: Net Traverse	Electronic/Digital Bar-Code Level or 3-Wire Leveling TSSS: Trig Leveling	Project Control – Horizontal (see First Order also)	Basic (Corridor) Control HPGN and HPGN-D Project Control
Third	1 : 10,000	e = 0.04√E (Note 5) e = 0.06√E (Note 5)	(Note 8)	As Required	GPS: Static Fast Static, Kinematic, RTK (Note 13) TSSS: Net Traverse Resection, Double Tie (Note 9)	Electronic/Digital Bar-Code Level Pendulum type Automatic Level	Supplemental Control > Engineering > • Construction • Interchange Major Structure Photo. Control – Horizontal Right of Way Surveys Construction Surveys (Note 6) Topographic Surveys (Note 6) Major Structure Points (Staked)	Project Control – Vertical Supplemental Control Photo. Control – Vertical Construction Surveys (Note 6) Topographic Surveys (Note 6) Major Structure Points (Staked)
G (General)	As required, see appropriate survey procedure section in this manual for accuracy standards/tolerances.			Not Applicable	GPS: Fast Static Kinematic RTK TSSS: Radial	GPS: Fast Static Kinematic, RTK (Note 12) TSSS: Trig Leveling , Single Wire, Direct Elevation Rod	Topographic Surveys (Data Points), Supplement Design Data Surveys, Construction Surveys (Staked Points), Environmental Surveys, GIS Data Surveys, Right of Way Flagging	

Notes

1. The standards, specifications, and procedures included in this Manual are based on Federal Geodetic Control Subcommittee (FGCS) standards and specifications. Except where otherwise noted, the FGCS requirements have been modified to meet Caltrans needs.
2. Refer to other Manual sections for detailed procedural specifications for specific survey methods and types of surveys.
3. "B" Order and First Order surveys are performed to FGCS standards and specifications or other requirements approved by National Geodetic Survey.
4. Distance accuracy standard.
5. Closure between established control; e = maximum misclosure in feet, E = distance in miles.
6. Survey setup points used for radial stake out.
7. For example a static GPS may be used to establish NAV88 at the project site from a distant NAVD National Spatial Reference System Control.
8. As required by the local survey needs.
9. Instead of including a point as a network point, certain survey points may be positioned by observations from two or more control points (i.e., double tied). If survey points are not included in a network, double ties must be performed to ensure that blunders are eliminated and the positions established are within stated accuracy standard. Double tie procedures should be only used when appropriate; possible examples are photo control points, land net and monumentation points, and major structure stake points.
10. The distance accuracy standard for Basic (Corridor) Control – HPGN-D surveys is 1:500,000.
11. Not to include vertical project control or vertical for major structure points.
12. Not to include pavement elevations.
13. Not to include major structures.

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